



A SYSCO Company

January 14, 2003

AMS Livestock and Seed Program
USDA Stop 0254
1400 Independence Ave., SW
Washington, D.C. 20250-0254

Attn: Chief, Standardization Branch

I am responding to your request for comments. As Founder/CEO, I have been directly involved in dry aging of beef since 1967. In 1997, in conjunction with Kansas State University, we embarked on a totally scientific and objective study of dry aging. I personally visited more than one dozen locations throughout the country that were dry aging beef. With my practical experience and those visits, we constructed a dry aging facility in Atlanta, Georgia. Subsequently, Kansas State University conducted a taste test panel. Please find enclosed the results of the Kansas State study as well as published articles that have appeared in trade publications over the years.

In conclusion, there are many variables for optimum dry aging. Key elements are temperature, humidity, spacing (the distance from one loin to the next) sanitation, circulation and the age of the product when introduced to the dry aging process. It is not necessary to dry age 35 days in order to achieve optimum dry aging.

Sincerely,

Howard I. Halpern
Founder/CEO

HH:dr
Enclosures





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September 14, 2001

Howard Halpern
Buckhead Beef Atlanta
2194 Marietta Blvd, NW
Atlanta, GA 30318

Dear Howard:

Greetings from Kansas State University. The dry aging project that we conducted for you a few years ago has now appeared in the scientific literature. Many good memories and excellent tasting come to mind. Since we completed that work, we have had numerous inquiries about dry aging, many of these folks have no idea how critical it is to control the process. Bob Campbell and I have been very careful to give generic answers about dry aging and the Buckhead Process as it is without doubt the premier dry aging process in the US. Your home page is quite nice, in fact, I have had students in a beginning Meat Science class surf the internet for meat companies and Buckhead's often comes out with excellent student comments.

Hope you find the reprints of interest. You can copy them if needed. If I get to Atlanta, a visit may be of order.

Sincerely,

Melvin C. Hunt
Professor

Kansas State University
Agricultural Experiment
Station and Cooperative
Extension Service

*"Knowledge
for Life"*

Dry-Aging Effects on Palatability of Beef Longissimus Muscle

R.E. CAMPBELL, M.C. HUNT, P. LEVIS, E. CHAMBERS IV

ABSTRACT: Beef strip loins and short loins were vacuum aged for 7 or 14 d, then these cuts were dry aged for 7, 14, or 21 d. At 2, 9, and 16 d of post-dry-aging vacuum storage, strip steaks were analyzed for sensory, physical, and microbial differences. Controls were vacuum aged for 14 d. Dry aging for 14 and 21 d produced steaks with greater ($P < 0.05$) dry-aged flavor, tenderness, and juiciness than controls or steaks dry aged for 7 d. Shear forces were lower ($P < 0.05$) for steaks dry aged for 21 d. Time of vacuum storage before and after dry aging had minimal effects on development of dry-aged flavor attributes.

Key Words: beef, dry aging, flavor, palatability, sensory

Introduction

AGING IS DEFINED AS HOLDING MEAT FOR A PERIOD OF TIME to enhance palatability (Anon. 1991). There are 2 types of aging. Vacuum or wet aging involves storing the product at refrigerated temperatures in a sealed barrier package, whereas in dry aging, the product is unpackaged and exposed to air at controlled temperature and relative humidity. Dry aging is no longer practiced widely because it results in weight losses up to 10% (Parrish and others 1991; Warren and Kastner 1992).

Numerous studies have been conducted on beef palatability over the past 40 years. Although many have found aging makes meat more tender (Minks and Stringer 1972; Parrish and others 1991; Smith and others 1979; Warren and Kastner 1992), disagreement exists about palatability aspects other than tenderness. Warren and Kastner (1992) found dry-aged products had more beefy and brown-roasted flavor than vacuum-aged or unaged products. This agrees with work by Diles and others (1994) and Hodges and others (1974), but others have found no difference or a decrease in palatability attributes, other than tenderness, of dry-aged products compared to unaged or vacuum-aged products (Davis and others 1975; Minks and Stringer 1972; Savell and others 1978). Hodges and others (1974) indicated beef flavor intensity increased in USDA Choice short loins after 15 d of dry aging, whereas USDA Standard short loins had less beef flavor intensity than controls. Beyond the scientific community, many believe in the flavor-enhancing effects of dry aging of beef (Ellis 1990). However, previous studies have focused only on times and conditions of dry aging. Virtually all fed beef is shipped in vacuum packaging; thus beef entering dry-aging operations will have been vacuum aged, and dry-aged product likely will be vacuum packaged again for distribution. Since no literature reports these combined effects, the present study examined the effects of time in vacuum before dry aging, duration of dry aging, and duration of vacuum storage after dry aging on the sensory, physical, chemical, and microbiological traits of beef longissimus muscle.

Materials and Methods

Storage Before Dry Aging

Certified Angus Beef short loins (NAMP 174, $n = 18$) and strip loins (NAMP 180, $n = 36$) were obtained from commercial processors and shipped (3°C) to the aging facility by commercial refrigerated transport. All loins arrived at the aging facility within 7 d of packing, and temperature monitors indicated loins were never frozen. Vacuum packaging had to be intact (no leakers) for product to be selected. Vacuum-packaged short loins and strip loins were stored in vacuum at 2°C for 7 or 14 d from packing date. After vacuum storage, the tenderloin was removed from short loins, leaving the lumbar vertebra intact and attached to the strip loin. These shell loins (short loin with tenderloin removed) and the strip loins were placed on racks for dry aging. Truck temperatures were monitored via the truck controls and verified using the trucker log sheets. Plant temperatures were monitored via the plant charts.

Dry Aging

Dry aging was conducted at 2°C and a relative humidity of 75%. Room temperature and humidity were monitored on continuous recording charts. After dry aging for 7 or 14 d, strip loins were trimmed and vacuum packaged. Shell loins were processed into strip loins (NAMP 180) by removing the lumbar vertebra after 21 d of dry aging, then trimmed, and vacuum packaged.

All aged loins and control strip loins were shipped to the Kansas State Univ. meat laboratory in insulated shipping containers (Kol-Boy Products, Cave Spring, Ga., U.S.A.) with reusable ice packs (Kol-Boy Products). Receiving temperatures of loins ranged from 0 to 5°C . Control strip loins ($n = 18$) were shipped so that they were always 14 d old when they were evaluated.

Storage After Dry Aging

Loins were stored in vacuum at 2°C for 2, 9, or 16 d after dry aging. At each sampling time, loins were removed from the vacuum package, and 2 steaks, 2.5 cm thick, were cut,

Table 1—Definitions for sensory evaluation of dry-aged steaks

Sensory Parameter	Definition
1. Overall aged-beef flavor intensity	A full, blended and sustained, cooked beef flavor that has fewer dominating individual flavor notes. This creates a smooth, balanced impression.
2. Beef flavor intensity	Amount of beef flavor identity in the sample. Reference: Grilled beef cube steak = 12.0 (grilled until internal temp = 77 °C.)
3. Brown/roasted flavor intensity	A round, full, dark, caramelized aromatic generally associated with beef that has been cooked with dry heat. Measured at its highest point during the initial 10 chews. Reference: Grilled beef cube steak = 10.5 (grilled until internal temp = 77 °C.)
4. Bloody/serumy flavor intensity	An aromatic associated with blood in cooked meat products. Closely related to the metallic aromatic. Reference: Sara Lee sliced roast beef = 6.0
5. Metallic flavor intensity	The impression of a slightly oxidized metal such as iron, copper, and silver spoons. Reference: Dole canned pineapple juice, unsweetened = 6.0
6. Astringent sensation intensity	The dry puckering mouth feel associated with putting an alum solution in the mouth. References: 0.5% alum solution = 2.5, 0.7% alum solution = 3.5
7. Tenderness	Ease with which the sample can be cut through with molars on 1st bite. Reference: Sara Lee sliced roast beef = 10.0
8. Juiciness	The amount of liquid expressed from the sample during the 1st and 2nd chews. Reference: Sara Lee sliced roast beef = 9.0

starting at the anterior end of the strip loin. Strip loins were repackaged for storage (9 and 16 d at 2 °C) after dry aging. After cutting, the steaks were wrapped in waxed freezer paper, stored overnight, and then evaluated for sensory and physical traits.

Steak Cookery and Sensory Analysis

Steaks were cooked at 350 °C on an electric grill (No. 8-44; Wells Powerline, Shelbyville, Ind., U.S.A.) for 4 min, then turned, and cooked for an additional 4 min. Steaks then were turned every 2 min until they reached 63 °C (medium rare). Cooking times ranged from 11 to 15 min. Internal steak temperature was measured using a hypodermic probe thermocouple (HYP2-21-1/2-T-G-48-OST-M; Omega Engineering Inc., Stamford, Conn., U.S.A.) attached to a 450 ATT thermocouple thermometer (Omega Engineering Inc.). The grill surface temperature was measured using an infrared thermometer (Infratrace, model KM800S, Comark Ltd., Hertfordshire, England, U.K.).

Cooked steaks were held at 20 °C for approximately 2 min and trimmed so that the center portion of the loin eye (no epimysium) muscle (longissimus lumborum) was served to the sensory panel. This center portion was cut into 1 × 1 × 2.5 cm pieces perpendicular to the surfaces that had been on the grill. Four of these pieces were placed randomly into each of 6 plastic cups labeled with the 3-digit code for that steak. Samples were kept warm by placing the cups on tiles preheated to 121 °C and presented to the sensory panel within 3 min of cutting.

The descriptive sensory analysis was conducted at the Sensory Analysis Center at Kansas State Univ. The facility had lighting, temperature, humidity, and noise controls, and the round-table panel room was designed according to the guidelines established by ASTM (1986). The panel was composed of 6 highly trained panelists employed by the Sensory Analysis Center. Each panelist had more than 120 h of intensive training in descriptive sensory principles and method and more than 1000 h of experience in food evaluation. During the orientation period (12 h over 2 wk), panelists as a group defined and then trained to determine 8 parameters (Table 1). Panelists rated each parameter on a 15-point scale with 1 as the lowest intensity and 15 as the highest. Reference standard for flavor parameters are listed in Table 1. At each panel session, 2 reference steaks, 1 dry aged for 21 d and a

control that had been wet aged for 14 d, were provided to the panelists to act as anchor points. Additionally, 2 control steaks were served in random order with the aging treatments at each panel session.

Microbial Analyses

Before strips were cut into steaks, 2 circular samples (2.54 cm in dia and 2 mm in thickness), 1 each from the fat and lean surfaces, were removed aseptically for microbial testing. Both samples from each loin were placed in a sterile stomacher bag with 100 mL sterile peptone water and stomached for 1 min, diluted as necessary, and plated to determine aerobic plate counts, lactic-acid organisms, and *Pseudomonas* spp. (Vanderzant and Splittstoesser 1992).

Physical Analyses

A 2nd steak from each treatment combination was cooked using procedures described previously. Steaks were weighed before and after cooking, and the percentage of cooking loss was calculated. Length, width, and thickness (at 3 points) also were recorded before and after cooking. Prior to cooking and immediately after, tracings were made of the steaks. The area of each tracing was determined with a video image analysis system (Optimas, ver 5.2; Seattle, Wash., U.S.A.).

To provide an instrumental measurement of tenderness, 6 to 8 cores (1.27 cm in dia) were removed parallel to muscle fibers from each steak 3 h after cooking. Each core was sheared once perpendicular to the fiber direction using a Warner-Bratzler shear attachment on an Instron (Model 4201, Canton, Mass., U.S.A.) with a 25-kg load cell and a cross-head speed of 250 mm/min. Peak force and total energy were averaged for all the cores from each steak.

Statistical Analyses

The experimental design was 3 replications of a 2 × 3 (vacuum-aging × dry-aging durations) factorial with a split plot on vacuum time post-dry-aging and for sensory data a 2nd split on panelist, with independent controls. There were 3 strip loins in each cell for each replication of the experiment. Using the GLM procedure of SAS (1994), when the model showed significant ($P < 0.05$) treatment differences, mean separation procedures were carried out using the LSD option (SAS 1994).

Table 2—Means of sensory scores for flavor traits after dry aging and after vacuum storage following dry aging

Dry aging, d	Aged flavor ^a	Beef flavor ^a	Brown roasted ^a	Bloody/Serumy ^a	Metallic ^a	Astringent ^a
0 (controls)	9.7 ^d	11.4 ^{bc}	10.4 ^c	4.8 ^c	4.9 ^{bc}	3.0
7	9.7 ^d	11.3 ^c	10.3 ^c	4.9 ^b	4.9 ^b	3.0
14	10.6 ^b	11.5 ^b	10.6 ^b	4.7 ^c	4.8 ^c	3.0
21	10.1 ^c	11.5 ^b	10.5 ^c	4.8 ^{bc}	4.8 ^c	3.0
LSD	0.25	0.13	0.14	0.13	0.13	0.09
Vacuum storage after dry aging, d						
0 (controls)	9.7 ^d	10.4 ^c	10.4 ^c	4.8 ^c	4.9	3.0
2	9.8 ^{cd}	11.4 ^c	10.3 ^c	5.0 ^b	4.9	3.0
9	10.5 ^b	11.6 ^b	10.6 ^b	4.7 ^c	4.8	3.0
16	10.0 ^c	11.5 ^{bc}	10.5 ^b	4.8 ^c	4.8	3.0
LSD	0.25	0.13	0.14	0.13	0.13	0.08

^a Flavor parameters were rated on a 15-point scale with 1 as the lowest intensity and 15 as the highest.

^{b-d} Means within a column with a different superscript letter are different ($P < 0.05$).

Table 3—Means of scores for tenderness, juiciness, and Instron shear force after dry aging and vacuum storage

Dry aging, d	Tenderness ^a	Juiciness ^a	Shear force (kg)
0 (control)	10.0 ^d	8.3 ^d	2.3 ^c
7	10.2 ^c	8.2 ^d	2.3 ^c
14	10.6 ^b	8.4 ^c	2.3 ^c
21	10.6 ^b	9.0 ^b	1.9 ^b
LSD	0.18	0.14	0.14
Vacuum storage after dry aging, d			
0 (controls)	10.0 ^d	8.2 ^c	2.3
2	10.2 ^c	8.4 ^b	2.3
9	10.6 ^b	8.6 ^b	2.1
16	10.6 ^b	8.5 ^b	2.0
LSD	0.18	0.14	0.14

^a Tenderness and juiciness were rated on a 15-point scale with 1 as the lowest intensity and 15 as the highest.

^{b-d} Means within a column with a different superscript letter are different ($P < 0.05$).

Results and Discussion

Vacuum Aging Before Dry Aging

Vacuum aging for 7 or 14 d produced no effects ($P > 0.05$) on dry-aged flavor parameters, tenderness, juiciness, length, width, thickness, area, weight, or changes in these parameters due to cooking (data not shown). Product stored for 7 d before dry aging had lower ($P < 0.05$) lactic-acid bacteria counts than product stored for 14 d. This was an expected result, because storage time in vacuum packaging favors the growth of these bacteria (Smulders 1987).

Dry Aging

Dry-aging time had significant effects on all sensory attributes, except for astringent (Table 2). Dry aging for 14 or 21 d increased ($P < 0.05$) dry-aged flavor compared to 7 d of dry aging and no dry aging (control), which were similar ($P > 0.05$). This agrees with Diles and others (1994), Hodges and others (1974), and Warren and Kastner (1992), who reported dry aging produced desirable flavor changes. However, Davis and others (1975), Minks and Stringer (1972), and Savell and others (1978) found no differences or a decrease in palatability attributes, other than tenderness, during vacuum aging. This may have been because of the marbling levels of the product studied. Hodges and others (1974) indicated high-quality grade product (USDA Choice) improved in flavor attributes, whereas lower quality grade product (USDA Good) did not. In the present study, strip steaks from product aged 21 d had less ($P < 0.05$) overall dry-aged flavor than steaks from product aged 14 d. However, the 21-d dry-aged product had the lumbar vertebra attached, so the lower flavor level may have been because of the reduced lean surface

area exposed to air.

Beef flavor and the brown roasted aromatics followed the trend observed with overall aged flavor; steaks dry aged for 14 and 21 d generally had higher ($P < 0.05$) levels of these flavor attributes, while the controls and the steaks dry aged for 7 d had lower scores (Table 2). For flavor attributes considered negative (bloody/serumy and metallic), the 14-d dry-aged products had lower ($P < 0.05$) scores than the 7-d dry-aged steaks, and the 21-d dry-aged steaks were similar to the 14-d dry-aged steaks. Astringent flavor was not affected ($P > 0.05$) by aging treatments. In general, these results agree with those of Warren and Kastner (1992).

Tenderness was lowest ($P < 0.05$) for the control steaks (14-d vacuum aged), and dry aging for 7 and 14 d significantly increased tenderness over the controls. Dry aging for 21 d produced steaks similar ($P > 0.05$) in tenderness to steaks dry aged for 14 d. Instron shear force was lower ($P < 0.05$) for steaks dry aged for 21 d compared to other treatments (Table 3). Controls and 7- and 14-d dry-aged steaks had similar ($P > 0.05$) shear forces. The continuing improvement in tenderness with aging by either method (vacuum or dry) beyond 14 d contrasts with reports reviewed by Jeremiah (1978) who found no significant improvements in tenderness after 11 or 14 d (Culp and others 1973; Smith and others 1979).

The control and 7-d dry-aged products had the lowest ($P < 0.05$) juiciness scores; steaks dry aged for 14 d were intermediate, and steaks dry aged 21 d had the highest ($P < 0.05$) scores. Savell and others (1978) also reported improved juiciness with aging. Explanations for increased juiciness with age might be that the meat has lost water-holding capacity and thus releases more juices as the meat is chewed, or that the

Table 4—Microbial counts at dry-aging times and at vacuum-storage times after dry aging

Dry aging, days	Aerobic count (log 10)	Lactics (log 10)	Pseudomonas (log 10)
0 (control ^c)	1.4 ^a	1.4 ^b	2.8 ^b
7	3.3 ^b	1.4 ^b	3.5 ^{ab}
14	3.9 ^b	1.5 ^b	5.3 ^a
21	3.3 ^b	2.0 ^a	3.3 ^{ab}
LSD	0.73	0.49	2.21
Storage after dry aging, d			
0 (control ^c)	—	1.4 ^b	—
2	—	0.6 ^c	—
9	—	1.7 ^b	—
16	—	2.4 ^a	—

a-b Means within a column with a different superscript letter are different ($P < 0.05$).

c Controls were vacuum packaged for 14 days.

fat has been concentrated by moisture loss during aging. More research into the physical and textural aspects of juiciness in dry-aged products is necessary for a definitive explanation of the juiciness increase. Dry aging did not affect ($P > 0.05$) cooking time or thickness, width, length, or area of steaks (data not shown).

Vacuum Storage After Dry Aging

Post-aging storage time also contributed to aged flavor (Table 2). Generally, flavor peaked for all dry-aging treatments at 9 d of post-aging storage and then decreased at d 16. Beef and brown-roasted flavors peaked at 9 d after dry aging, although they did not differ statistically from scores for steaks stored for 16 d. Bloody/serumy flavors peaked at 2 d after dry aging and then decreased ($P < 0.05$) at 9 and 16 d. Vacuum storage after dry aging did not affect ($P > 0.05$) metallic or astringent flavors.

Tenderness improved ($P < 0.05$) during post-aging storage (Table 3). Steaks stored for 9 and 16 d after dry aging were most tender; those stored for 2 d were intermediate, and the control steaks were least tender. Juiciness was not affected by post-aging storage, however, at all post-aging times, juiciness was higher ($P < 0.05$) for all dry-aged steaks than for control steaks. Storage after dry aging had no effects ($P > 0.05$) on shear force (Table 3); cooking time; and changes in length, thickness, width, and area after cooking (data not shown).

Microbial Growth

Compared to controls, all of the dry-aged steaks had higher ($P < 0.05$) aerobic plate counts (Table 4). Duration of dry aging did not affect ($P > 0.05$) aerobic counts. This lack of response to dry-aging time may have been because of growth inhibition caused by surface drying and storage temperatures low enough to retard growth. As expected, counts of anaerobic lactic-acid bacteria increased during storage of vacuum-packaged, dry-aged product (Table 4). At 2 d of storage after dry aging, the counts for all dry-aged strips were lower than those for controls. Counts of other organisms (aerobics and *Pseudomonas*) were low ($< \log 5$) and too variable to show any trend due to storage after dry aging.

Conclusions

Clearly, dry aging for a minimum of 14 d increased some flavor attributes in high-quality beef that are not typically associated with vacuum-aged beef. Tenderness and juiciness also improved during dry aging. The development of palatability attributes can be sufficient to offset the expense incurred due to dry aging. The mechanism that imparts the flavor changes in the presence of air and drying conditions is

still not well elucidated. Vacuum storage for up to 14 d before and 16 d after dry aging did not have major effects on palatability changes imparted by dry aging. This means purveyors who want to dry age their products can still achieve the flavor changes associated with dry aging using beef that was previously vacuum packaged. Further, since vacuum packaging after dry aging does not impair the flavor attributes of dry-aged beef, the product can be repackaged after dry aging for storage, transport, and inventory control for the end user. Costs associated with dry aging have to be evaluated against the benefits of enhancing certain flavors.

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- Ms. 20000539

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Buckhead's signature dry-aged beef products helped set Howard Halpern and company on a fast growth track. The company's dry-age coolers operate around the clock.

Aged to perfection

BY BARBARA YOUNG-HUGUENIN, EDITOR-IN-CHIEF

Atlanta-based Buckhead "dry-aged" Beef Co. is profiting from its scientific approach to custom meat processing.

State of the art doesn't just refer to machines at Buckhead Beef. That also is the characterizing quality of master butchers at the Atlanta plant, who produce the precise custom-cut line of steaks and other red-meat products.

"We're into hand-cut steaks," Howard Halpern says emphatically. "They are properly cut, proper-

ly aged, properly handled, and properly packaged."

Halpern, co-owner and president of the 15-year-old company eyeing \$300 million in sales this year, minces no words describing his company's commitment to beef manufacturing, pure and simple.

"The American beef industry is



A weigh system featuring a customized software program is the centerpiece of Buckhead's packing area.

meat cutters.

Halpern and Michael Vasquez, director of human resources, attribute their success in recruiting and training quality employees to wages above industry standards, offering a career not just a job, an impressive safety record, and the company's anti-drug and anti-harassment policies.

"We got serious and became a drug and alcohol free work environment," Vasquez says. "We have better quality workers in the custom-cut shop and production areas." Buckhead's pay scale is up by 35 percent over the past two years.

Concerning worker safety, Vasquez says meat cutters are required to wear safety gloves and all employees subjected to excessive lifting wear safety belts.

"Our workman's compensation cases are down over the last three years, thanks to our dedication to

work-place safety," Vasquez reports."

There are no line speeds here, but 42 workers produce 80,000 pounds of various cuts of steaks including T-bones, porterhouse, Kansas City, top butt, and tenderloin five days a week in two shifts.

In the custom-cut and other production areas, 85 additional cutters, packers, and supervisors produce another 170,000 pounds of product each week, including CAB cut steaks, prime and choice beef cuts, and lamb, veal, and pork items.

A weigh system featuring a customized software program is the centerpiece of Buckhead's packing area. Sales team members feed orders to the system designed to record essential information for labels, including pack and code date, time, and bar code. A second label records account name and address, order

number, and delivery route. The box is secured with a strong strap in the final step.

The odds are 65,000 to one that the right product reaches its destination, Halpern boasts.

"The system takes away the guess work," he says. "Scales are calibrated hourly and tare weight [container weight minus total weight to determine weight of contents] is USDA-approved."

An in-house crew completely sanitizes the facility beginning at 11:30 p.m. at the end of the second shift.

"Our sanitation standards — from receiving to processing to delivery — consistently receive top ratings from government and independent experts in food safety and hygiene," Halpern boasts.

Buckhead is 95 percent ready to implement HACCP by the January 26, 1999 deadline, reports Mark Petronic, production manager, adding that a recall system also is in place.

Since the raw material arrives vacuum-packaged and boxed from slaughter suppliers, Buckhead only conducts tests to detect bacteria counts. Meat trimmings are sold to a company that cooks the product, which then is suitable as an ingredient.

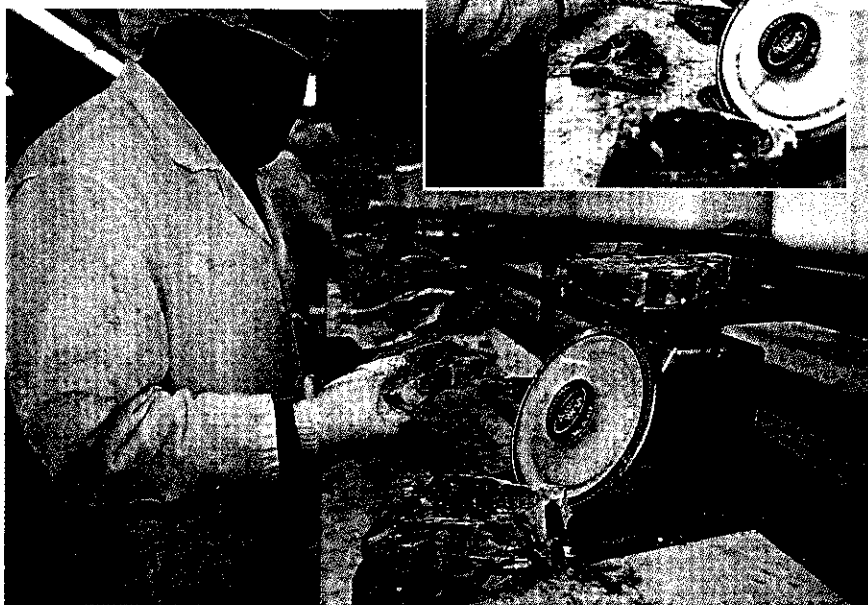
Facility expansion signals new round of growth

It's hard to believe that Buckhead started its plant operation in 6,000 square feet of space. Now 14 expansion projects later, the production facility is larger by 60,000 square feet with an expected increase to 90,000 square feet by spring 1999.

A major addition to the cut shop is on the agenda and about an acre of space will be added for receiving and shipping. These improvements are expected to triple production. **NP**

PLANT STORY

PHOTOS BY VITO PALMISANO PHOTOGRAPHY



Buckhead's skilled meat cutters handle more than 250,000 pounds of custom products a week, including dry-age steaks and USDA Prime and Choice selections.

highly efficient at delivering taste and satisfaction," he says.

Buckhead handles 1.5 million pounds of meat each week. A 16-digit bar code tracks the product from kill date to its delivery to customers.

The signature product is dry-aged beef that yields quality steaks for HRI customers, however. Buckhead joined the *Certified Angus Beef* (CAB) program in 1992 after a nearly 10-year pursuit. Buckhead now ranks as the leading purveyor of CAB product distribution. Indeed, every fifth box of product shipped bears the CAB logo.

Even so, dry-aged beef is the company trump card.

"We are a beef company and that's why the word is part of our name," Halpern says. "We don't cook, marinate, inject, or tumble anything. All we do is hand-cut steaks. That's our niche. Others can do the rest."

Producing dry-aged beef, Buckhead's signature product, costs 30 percent more than wet-aging partly because of the need for immaculate

computer-monitored coolers dedicated solely to that product.

In the early days beef was hung in coolers until the meat matured, but the process evolved into a hit-and-miss system as wet-aging in vacuum packaging overshadowed the art of dry-aging.

"Controlling mold growth is the secret to dry-aging," confides Halpern, adding that mold spores grow within 24 hours. "Aerobic bacteria enhances the aging," he explains. "You retard mold growth by keeping the aging room in an immaculate sanitation state."

Anaerobic bacteria returns to the process with vacuuming packaging.

Product is held for 21 days in the dry-age coolers, which are sanitized over a 48-hour period by washing and airing. Coolers are rotated to avoid interruptions in the dry-age process.

Buckhead invested \$2.3 million in its dry-aging program and commissioned scientists at Kansas State University to help develop a system of uniformity and consis-

tency. The equipment cost for the separate dry-aging processing room amounted to \$500,000.

"The academic study was designed to establish a base line on dry-age versus wet-age processing," Halpern explains.

The university's sensory panel determined that dry-aging beef significantly increases tenderness and juiciness while decreasing off flavors. Moreover, dry-aged beef cooks faster and shrinks less thanks to the absence of excess moisture.

Halpern says there are three conditions governing properly aged beef, which has a distinctive nutty flavor due to the presence of yeast produced during the aging process. They include consistent temperature control, consistent humidity, and immaculately sanitized coolers and cutting rooms. Even the velocity of air circulation must be controlled, notes Halpern, adding that all the factors involved in dry-aging must work perfectly to ensure a quality product.

Cutting non-frozen steaks is another quality aspect at Buckhead, which sells less than 1 percent of its steaks frozen.

"There never will be a frozen steak as good as a non-frozen one," Halpern says. "Freezing stretches fibers adding shrinkage and purge. I'm not saying there is no good frozen meat. We're talking better here."

Meat cutters are star players at Buckhead Beef

"We won't out-machine anybody," Halpern says. "We are the back of the house for our customers who trust us to buy the right animal from the right part of the country and then to fabricate it properly. We either hold the meat to properly age it or send it to our cut shop for further processing."

And that's where Buckhead's skilled meat cutters come in. The company is blessed with a workforce of meat cutters who brought experience and an apprentice program to continually train future

MEAT INDUSTRY MAVERICK

Buckhead Beef is not your average company in the meat purveyor category. And Howard Halpern, founder and co-owner of the Atlanta-based business, didn't come this far on mediocrity either.

His company made a quantum leap from its startup 15 years ago when conventional wisdom leaned toward eschewing the meat business from scratch, especially to sell beef.

But Halpern marched to his own drum and confidently set out to buck the odds. The company grew by \$100 million in 1997 alone. It generated less than \$1 million in 1983, but peaked at \$50 million in 1993 on its 10-year fiscal anniversary. Today Buckhead expects to end 1998 with \$300 million in sales.

Halpern and his cohorts built Buckhead's reputation of quality by offering naturally dry-aged *Certified Angus Beef* and USDA Prime Beef. The company comprises 20 sales offices that reach more than 100 markets in the southern United States, Puerto Rico, the Bahamas, and Bermuda. It exports to the Pacific Rim.

This past July, the company opened a new regional distribution complex called Buckhead Beef Northeast in South Plainfield, NJ. Earlier in the year, Buckhead began marketing throughout the country.

"We have brand identification with multi-unit steakhouse operators," Halpern confides.

Halpern knows a thing or two about driving for success. After all, he is the man who convinced a venture capitalist to back his business dream of building an operation by merging the expertise of an in-house cut shop with the efficiency of a large-scale distributor.

"They said I was twenty years ahead of my time," Halpern says. "I was the first company that I knew of to go exclusively into the meat business back in 1983, a time of great industry consolidation and when consumers were told they shouldn't eat meat."

Undaunted, Halpern says he decided to take the old purveyor mentality of offering expertise to the restaurateur, steakhouses, and hoteliers and couple that with operating as a low-cost provider.

"I wanted to make a statement in the meat business," he says. "I developed the business on the basis of single-digit operating costs, including paying for meat cutters and packaging supplies. Historically meat purveyors as a category operated on between fifteen and twenty-three percent as the cost of doing business."



My goal was a company with gross profits lower than my competitors' operating costs. Even though I was a little six-people company, my cost of doing business would be lower than the biggest giant in the business."

His formula worked and the numbers speak for themselves. Moreover, Buckhead Beef is the only surviving meat purveyor in the greater Atlanta area of the 19 that existed in 1983.

"We're the fastest growing company in our industry on a percentage basis," Halpern says. "If you are known for top-quality meat at low costs and you are considered an innovator, you'll get the business."

Halpern and his 300 employees, 50 of which are on the sales side, expect to sell quite a bit more beef between now and 2005 to fulfill their goal of making \$3 billion by then.

Not to worry, this can-do tycoon has a plan just like he did 15 years ago.

"We need strategic distribution centers to grow like we want," Halpern says. "And we'll need to take an even bigger step with a second cutting facility in about two years."

That growth also calls for saturating markets in the United States, expanding international sales, and a larger workforce.

"We went from zero to seventeen million dollars just like that [snaps fingers] when I was a one-man management team," recalls Halpern.

"I have learned that our greatest asset is our knowledge and we share it with our customers to build a relationship and to bond with them."

I show them, I train them, and we open up our books. The biggest part of our growth has been on cost-plus programs. We show true operating costs, which include the cost per pound for packaging and labor. I have the lowest operating cost in the industry."



As director of Buckhead's Culinary Center, Andrew Sugrue (at right) is the in-house chef at the company headed by Howard Halpern (left).



Buckhead Beef is a family company whose hands-on management team includes (from left) wife Lynne Halpern, accounts receivable manager; Howard Halpern, president; and son Kirk Halpern, operations manager.



BUCKHEAD BEEF President Howard Halpern, Atlanta, believes dry aging is a tremendous opportunity to improve beef's taste and tenderness. "But it has to be done right, or not at all," he says. PHOTO COURTESY OF BUCKHEAD BEEF

Beef—a la natural

Full-bodied flavor, no sharp edges, and some kinda good beef.
Buckhead Beef rediscovers the dry aging process

By BECKY MILLS

A Hollywood director could have a field day in the dry aging facility at Buckhead Beef. A ghostly blue light illuminates trays of sub-primals. Combined with the chill and humidity, the light source gives the room an eerie, supernatural look and feel.

It should. The steaks-to-be lurking in those hunks of beef metamorphose into an out-of-this-world eating experience.

One bite and you'll swear you're already in the Promised Land.

But, let's get back to the facts. "We determined through research and scientific proof we could greatly enhance quality beef by dry aging," says Howard Halpern, Buckhead Beef president. "We can increase flavor, tenderness and juiciness by up to 50%."

Two years ago, Halpern embarked on a six-month odyssey of research and development (R&D), conducted in part

with the meat science team at Kansas State University. After combining the knowledge with state of the art facilities, Halpern has the process down.

After conventional processing, usually in one of Excel's or IBP's Midwestern or Great Plains plants, the vacuum packed sub-primals are shipped to Buckhead Beef's Atlanta, Ga., operation. When one of the three dry aging rooms are empty, the beef is unwrapped and placed on the racks in the facility. ►

As for the time between processing and dry aging, Halpern says, "The less time the better. We get it out of the bag in 10 days or less. Seven is better." He explains, "One of the problems with dry aging over the last 35 years is they let it age anaerobically for two to three weeks. Then the aerobic bacteria can't take over."

The aging facility is maintained at 35° F. Temperature is No. 1 on Halpern's three commandments of successful dry aging. "You must maintain a consistent temperature," he says. "When we built our dry aging facility, we installed a computer that controls temperature, not just monitors it."

With wet aged, or vacuum packed beef, Halpern says temperature is not as critical. "Forty to 45 degrees is not the most desirable temperature, but it does not adversely affect it over a short time. That is not true of dry aging."

"The temperature range with dry aging is narrow," agrees Robert Campbell, Kansas State meat scientist. He recommends a temperature of 35° to 40° F. "Too cold and it freezes; too warm and you can get spoilage," he notes.

Humidity is the second commandment—it, too, shall stay constant. Hence, the all-in, all-out nature of the dry aging facility and the three separate rooms—one for each week of a sub-primal's stay.

"We discovered the best results come from maintaining 75% humidity," says Halpern. "More than a third of the shrink occurs in the first 48 hours. We had to divide the rooms to prevent the transfer of moisture from the new dry aged beef to the older."

Third on the list is sanitation. Halpern emphasizes, "Immaculate—not clean—immaculate. Mold spores will grow at 65% humidity unless you start off completely sanitized." This is where the blue light comes in. Although it looks like a grow light, it's actually an anti-grow light for mold spores.

At the end of each week, when the beef is moved to the next room in the three-week process, a sanitation crew sanitizes the rooms before the next batch is moved in. Break, or even fudge on, one of the three commandments and Halpern says you run the risk of ruining a potentially wonderful product.

"It's either terrible or 100%," he says. "If you really want to improve beef, dry aging is a tremendous opportunity, but it has to be done right or not at all."

With all the R&D Halpern invested in dry aging, you'd think it was a new pro-

Halpern doesn't waste his newfound knowledge and opportunity on the ordinary. At Buckhead Beef, only Certified Angus Beef and USDA Prime cuts go into the dry aging facility

cess. Not so. In fact, in the company's advertisements, it's referred to as a natural lost art. Halpern explains, "Historically, beef has been aged aerobically—in the presence of oxygen. Wet aging, anaerobic aging, is relatively new. We've only been packaging beef in Cryovac for 35 years."

Halpern experimented with dry aging for years, but the 1996 Olympic Games in Atlanta gave him the catalyst he needed to get serious. To meet the booming market for beef during the Olympics, Halpern expanded his facility. When the city quieted down, he had the room and resources to dive into the process.

"We had done it twice with pretty good results," Halpern relates, "but there is a great deal of myth to dry aging. When I was a kid, we thought the longer the

whiskers on the beef, the better. We wanted to look at it with a good scientific approach."

Halpern also had the market for the upscale product, compliments of the growth of upper-end steakhouses. He doesn't waste his newfound knowledge and opportunity on the ordinary. At Buckhead Beef, only Certified Angus Beef and USDA Prime cuts go in the dry aging facility.

"Dry aging is for quality beef," he says. "You can get decent results out of Choice, but ever since USDA lowered standards in 1976, you're as likely as not to end up dry aging what was USDA Good."

The result of this combination of art, science and passion is a steak Halpern describes as "full bodied, no sharp edges. Dry aging reduces the metallic or off flavor by 75%. It rounds out the flavor like a fine wine."

Still, the investment required to produce such heavenly manna doesn't come cheap. Halpern says the dry aging process adds about 25% to the cost of the product. He isn't getting paid for his efforts—or at least not as much as he should. So, then, why?

"It needs to be done. It's for the love of the industry. I get a lot of pleasure out of people saying that's the best steak they've ever had. With technology that exists today, we can produce the finest steak that exists or ever existed."

A rare find

■ Is your mouth watering yet? Want to try one of those delectable dry aged steaks? Sorry, it's only available in a few exclusive markets.

Buckhead Beef is the country's largest purveyor of Certified Angus Beef product, but only a very select 5% of the 7 million pounds of Certified Angus Beef and 3 million pounds of the USDA Prime they peddle annually goes through the dry aging process.

Buckhead Beef's main customers are casino steakhouses, the ones reserved for high rollers. They also serve exclusive country clubs, with high-minded chefs and members with sacks full of money, as well as fancy steakhouses in big cities where a meal sets you back \$60 a plate.

But don't despair. Someday it will trickle down. Halpern's message to producers today is: "Grow quality

beef. There is an identified market of considerable size that demands good eating beef. People may not eat a steak every day, but when they eat one, they want a good one."

Robert Campbell, Kansas State meat scientist, agrees that quality sells. In early September, the Choice-Select spread was \$10. But he adds, "Where quality really makes a difference in price is in the middle meats—the rib and loin cuts." For example, when Select strip loins were \$2.81/lb., Choice strip loins were \$4.17/lb. and Certified Angus Beef strip loins were \$5.70/lb.

If you're still not convinced there is a market for your quality product, consider another one of Halpern's statistics: "The fastest growing segment in the restaurant industry is steakhouses—at 15% a year."

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Dry-Aging. A Rediscovered Art

Buckhead Beef's signature product, dry-aged beef, is the result of cutting-edge technology meeting old-world tradition. Buckhead Beef has the largest inventory of properly aged USDA Prime and Certified Angus Beef™ in the United States.

The most popular form of aging, wet aging involves aging beef in a vacuum packed or anaerobic environment. Most commonly referred to as cryovacing, this process was established to assist in the transportation of beef over long distances. Over the years, transportation and storage facilities have improved, but the art of dry aging remained hidden, until now.



By aging our beef aerobically in the computer controlled environment of our Atlanta headquarters, Buckhead Beef is resurrecting what was once the traditional method of aging beef, dry aging beef.

Aging Beef: A Research Report by Robert E. Campbell

Buckhead Beef of Atlanta, GA has developed some new twists to an old idea. In the past, beef was aged in the air, because it took a week or more for the product to get from the slaughterhouse to the retail market, and then it took even longer for the market to cut the sides of beef up. Throughout this process the beef would age and at some point, people noticed that beef from air-aged carcasses was more flavorful. Since the introduction of vacuum packaging, the use of dry-aging has been reduced to the point where only a few prime shops and high-end restaurants continue the practice. Many steak cutting operations continue to age product in vacuum packaging, and this does have some impact on tenderness, however vacuum or wet-aging has never developed the beef flavor associated with dry-aged product. The other reasons that large-scale dry-aging lost favor with most purveyors is that the process can involve considerable weight loss due to drying. Additional losses can occur due to less than immaculate sanitation causing mold and spoilage. At Buckhead Beef, strict sanitation and excellent temperature control has eliminated the losses due to mold and spoilage, and research has shown that the superior flavor, tenderness and juiciness is worth the wait for dry-aged product.

Buckhead Beef has the largest inventory of properly aged USDA Prime and Certified Angus Beef in the United States.

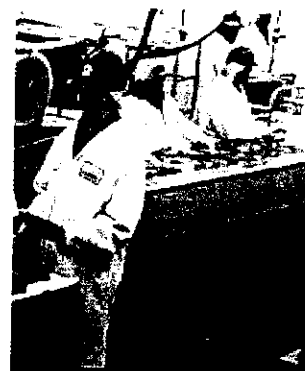
State-Of-The-Art

Top multi-unit steak houses, restaurants and hotels are as demanding as we are. Our cut shop is beyond state-of-the-art. It specializes in precision. Surgical precision cutters. It trims fat from budgets while creating perfect portions. We don't pump, marinate, press, form or machine cut steaks. We slice memorable meals. Our costs are cut too. Because of the amount of meat that moves through Buckhead Beef's continuously USDA inspected plant.

Whatever it takes to perfectly carve out your niche.

Quality, Technology & Food Safety

Buckhead's beef comes through one of the most modern, well-equipped, continuously USDA inspected facilities in the U.S. Top sanitation standards gain us high ratings from government and independent experts in food safety and hygiene.



Buckhead Beef is committed to food safety. Buckhead Beef utilizes the HACCP (Hazard Analysis Critical Control Points) program to aid in the prevention of food contamination and the introduction of food borne illnesses. This program was created to prevent food products from being contaminated, thus assuring complete food safety, beginning with the product being received by Buckhead Beef and ending with delivery to the customer.

Culinary Center

Buckhead Beef's Atlanta headquarters hosts one of the premier dining and conference facilities in the entire Southeastern United States. Buckhead Beef's culinary center boasts state of the art restaurant equipment, a wine cellar, and a fully functional conference facility capable of accommodating over 150 people. The Center has played host to sales seminars, media briefings and industry specific gatherings since it officially opened last year.



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